

WHAT IS CLAIMED IS:

1. A sorbent cartridge for use in preparing samples for chemical analysis, comprising:

a pipette tip having a longitudinal axis and a hollow distal tip with tapered walls defining an interior cavity extending along the axis and opening at a distal end of the tip;

a porous barrier in the tapered cavity placed at a predetermined location in the tip to define a sorbent volume between the barrier, the cavity walls and the opening at the distal end of the tip, the barrier allowing processing fluids to pass through the barrier; and

a sorbent material in the sorbent volume, the sorbent material being selected for use in the chemical analysis and the barrier being selected to prevent passage of the sorbent material out of the sorbent volume.

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2. The sorbent cartridge of Claim 1, further comprising a manually operated suction device on the pipette to exert a suction on the pipette to draw processing fluids through the opening in the tip, through the sorbent material and through the porous barrier.

3. The sorbent cartridge of Claim 1, wherein the pipette tip has a second opening opposite the opening in the distal end, and further comprising a setter configured to mate with the second opening to place a first cavity in the setter in fluid communication with the porous barrier, the setter having a plunger slidably received in a second cavity in the setter and placed in fluid communication with the first cavity, the plunger and second cavity sized relative to each other so as to create a suction sufficient to draw fluid from the opening in the tip into the cavity in the setter when the plunger slides in the second cavity.

4. The sorbent cartridge of Claim 1, where the size of the opening in the tip is from about 2-10 times the size of the material used in the sorbent material.

5. The sorbent cartridge of Claim 1, wherein the sorbent material is placed in the cartridge by drawing a slurry of a solvent and the sorbent material through the opening in the distal end of the tip, with the slurry solvent passing through the porous barrier to leave the sorbent in the sorbent volume.

6. The sorbent cartridge of Claim 1, wherein the sorbent material has a coating of a solvent that is sticky enough to cause sorbent material to stick together and resist passage out of the opening in the tip.

7. The sorbent cartridge of Claim 5, wherein the solvent is one of glycerol, ethylene glycol, or propylene glycol.

5 8. A sorbent cartridge, comprising:

a pipette tip having an interior cavity in fluid communication with a distal opening located in the tip;

10 a filter placed in the tip and defining a predetermined volume between the barrier and the distal opening; and

a sorbent material substantially filling the volume, the barrier retaining the sorbent material in the predetermined volume while allowing passage of processing fluids through the filter during use of the cartridge.

15 9. The sorbent cartridge defined in Claim 8, wherein the pipette tip has a second opening adapted to removably receive a syringe to draw fluid from the distal opening, through the sorbent material and filter into the syringe.

10. The sorbent cartridge of Claim 8, wherein the predetermined volume is tapered toward the distal opening to form a frusto-conical shaped cavity and the porous barrier comprises a frusto-conical filter.

20 11. The sorbent cartridge of Claim 8, wherein the distal opening has a diameter of about 2-10 times the maximum diameter of the sorbent material.

12. The sorbent cartridge of Claim 9, wherein the syringe contains a fluid drawn from the distal opening through the sorbent material and filter.

25 13. The sorbent cartridge of Claim 8, wherein the sorbent material has a coating of a solvent that is sticky enough to cause sorbent material to stick together and resist passage out of the opening in the tip.

14. The sorbent cartridge of Claim 13, wherein the slurry solvent is one of propylene glycol, ethylene glycol or glycerol.

30 15. An apparatus for analysis of fluid samples for use in chemical analysis, comprising:

a hollow tip having an opening in a distal end;

means in the tip for retaining a porous barrier at a predetermined location to define a sorbent volume between the barrier and the opening in the hollow tip;

5 a sorbent material retained in the sorbent volume by the porous barrier, the barrier allowing passage of fluids but not the sorbent material, during use of the apparatus;

suction means in fluid communication with the hollow tip to suck fluid through the opening in the distal end and through the sorbent material and porous barrier.

10 16. A method of forming a sorbent cartridge, comprising the steps of:

placing a porous barrier at a predetermined location in a hollow tip of a pipette to define a sorbent volume between the barrier and an opening in a distal end of the tip; and

15 sucking a slurry of sorbent into the sorbent volume through the opening in the distal end of the tip until the volume is filled with sorbent and sucking the solvent through the barrier while the barrier prevents passage of the sorbent, the solvent being selected so to permit use of the sorbent for an intended chemical analysis.

20 17. The method of Claim 16, comprising the further step of sucking a washing fluid through the opening, sorbent and barrier to remove undesired sample components from the sorbent.

18. The method of Claim 16, comprising the further step of placing at least one cap on the pipette tip to help prevent degradation the performance of the sorbent.

25 19. The method of Claim 16, comprising the further step of placing a manually operated suction device in fluid communication with the tip to draw fluids through the opening, sorbent and barrier and into the suction device.

20. The method of Claim 16, comprising the further step of placing a syringe in fluid communication with the tip to force fluids through the barrier, sorbent and opening.

30 21. The method of Claim 16, wherein the solvent leaves a coating on the sorbent that causes the sorbent material to stick together and resist passage out of the opening.

22. The method of Claim 16, wherein the solvent is selected from the group comprising glycerol, ethylene glycol, or propylene glycol.

23. A sorbent cartridge formed by the method of Claim 16.

24. A sorbent cartridge formed by the method of Claim 19.

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25. A sorbent cartridge formed by the method of Claim 21.

26. A sorbent cartridge formed by the method of Claim 12.

27. A method of forming and using a sorbent cartridge for chemical analysis, comprising the steps of:

10 placing a porous barrier at a predetermined location in a hollow tip of a pipette to define a sorbent volume between the barrier and an opening in a distal end of the tip;

15 sucking a slurry of sorbent into the sorbent volume through the opening in the distal end of the tip until the volume is filled with sorbent and sucking the solvent through the barrier while the barrier prevents passage of the sorbent, the solvent being selected so that it does not degrade later use of the sorbent for

chemical analysis, and

20 sucking another fluid through the opening, sorbent and barrier to interact the other fluid with the sorbent and then withdraw the other fluid from the sorbent.

25 28. The method of Claim 27, wherein the solvent is selected to leave a coating on the sorbent that causes the sorbent to stick together and resist passage out of the opening.

29. The method of Claim 27, comprising the further step of drawing the other fluid into a removable container after it has interacted with the sorbent, and removing that other fluid from the removable container for further analysis or processing.

30 30. The method of Claim 28, comprising the further step of drawing the other fluid into a removable container after it has interacted with the sorbent, and removing that other fluid from the removable container for further analysis or processing.

31. The method of Claim 27, comprising the further step of applying a positive pressure through the barrier into the sorbent and out the opening to expel the sorbent for further analysis or processing.

32. The method of Claim 28, wherein the removable container comprises a body of a syringe that is used to draw the other fluid through the opening, sorbent and barrier and into the syringe.



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